

THE GARLAND GLOBE
SATURDAY, MAY 8, 1909.

METHODS FOR CONTROL

OF THE CODLING MOTH.

By E. D. Ball, Agricultural Experiment Station, Logan, Utah.

The development of the present efficient methods for the control of the codling moth has not been the result of the work of any one man, or even of one generation of men. Banding and scraping the bark were practiced by our forefathers. No satisfactory remedy, however, was known for the pest until after the discovery of the value of spraying with the arsenicals for leaf-eating caterpillars, which was made in the early '70s. While using this remedy for other insects it was found that the codling moth was reduced in numbers at the same time. From this accidental discovery has arisen, by slow steps, the method of control used in the Eastern states today. To control the leaf-eating insects it was necessary to use a fine mist spray. They were also troubled with fungi and soon learned to mix bordeaux with it, and this triple combination spray is largely used up to the present time. Spraying for everything at once means spraying for nothing in particular, and as a result it was necessary to put on a large number of sprays to accomplish the purpose, and even then the results were poor, eighty to eighty-five per cent of sound apples being the exception rather than the rule. Several men were conspicuous in helping develop these methods, and in adding to our knowledge of the life habits of the insect. Professor Cook of Michigan and Professor Forbes of Illinois perfected the use of the arsenicals. Dr. Howard, of the Government Bureau, added much to our knowledge of the insect. Professor Card of Nebraska found out where eggs were laid, while Professor Slingerland of Cornell gave us the most complete treatise on the insect that has been written.

While this was going on in the East, Western orchards were growing and the codling moth, with the spirit of the age, migrated westward and through its rapid multiplication under our favorable climate soon threatened the destruction of our growing fruit industry. With the rapid increase in the number of worms to fight came a corresponding decrease in the success obtained, and a large number of the fruit growers became discouraged. To cap the climax the word went forth that the poisons were being adulterated to such an extent that they were of very little value and as a result many abandoned the fight. A few of the more persistent, however, only redoubled their labors, and as the worms increased, increased the number of arroyos and thus held their own in the contest. Professor Simpson was sent out by the Government to introduce the Eastern method of spraying. Through the fact that he used power sprayers he succeeded in obtaining even better results than they had obtained in the East. He evidently did not realize the importance of the extra power applied in getting these results, however, as he was very careful to recommend the use of a fine mist and gave directions to cease spraying as soon as the trees began to drip.

The writer came to Utah in 1902, just at the time when things were at their worst. The worms were increasing in numbers, one brood was supposed to follow another in quick succession; the poison was held to be adulterated and many people who had formerly been successful were now losing their crops and knew not why. The writer had worked on this insect with Professor Gillette in Colorado for five years, and as a result of these studies the Professor published the statement that the insect produced only two broods annually in that state. The first season's work in Utah convinced the writer that the insect had the same number of broods in this section as it had in Colorado, and he also succeeded in proving by experiment the great value of the driving spray. Armed with these results, this method of spraying was publicly advocated and presented to the Northwestern Fruit Growers' Association in Portland in January, 1904. This was its first presentation to any horticultural body, and its reception was not flattering. Flattering, in fact, would be a much more accurate description of just what happened at that meeting. The same idea was, however, presented the next year before the same association, at Boise, Idaho, but backed up with all the figures at the writer's command, as well as by the results obtained by Utah growers the previous year. Others by this time had tried the method and it was accorded a somewhat different reception. Bulletins were published on these experiments and further details given before the fruit growers' meeting at La Grande, Oregon, in 1906. Mr. Eldred Jenne published the results of an investigation on this insect's life history in the State of Washington, in 1905, and Professor Melander and Mr. Jenne published the results of their first tests of this method of spraying

in 1906. The writer first suggested the possibility of controlling this insect with a single spraying at the Boise meeting in 1906, but did not recommend it for the average grower. Since that time, however, practical results in a number of orchards in Utah have warranted its recommendation, and Professor Melander's experiments in Washington have confirmed this. Professor Melander has also tested dilute solutions of arsenate of lead with good results.

The writer presented this method of spraying to the entomologists of the Eastern United States at their meeting in New York in 1906, with the suggestion that if they would apply the codling moth spray by itself and use the driving method, that they would be far more successful than with the combination spray used at present. Several of the Eastern states have since that time tried this method, and some of them have had very good success. Professor Gossard of Ohio succeeded in obtaining ninety-seven per cent sound in one test with one early spraying. Such in brief is the history of the development of our present spraying methods.

The Method in Detail.

"Nothing short of perfection" is the standard of the Northwest in its production of fruit. "Nothing short of extermination," it is its attitude towards the codling moth, and the results of the last few years have shown that it is attaining very close to its ideal in both directions. The method of spraying here advocated is the one that has enabled Western orchardists to attain to their present supremacy, and while some of the details are matters of choice, and good spraying can no doubt be done and fair results obtained even where one or two of the points mentioned are neglected, still experience has taught that it is well for those who wish to do the very best work to modify this practice but little.

The Codling Moth.

Better work will always be done where founded on a knowledge of why it is done. No excuse therefore is needed for giving a summary of the insect's life history. The moth is a small shy creature, rarely ever seen, flying only in the dusk of the evening and then with a rapid zig-zag motion hard to follow. In color it resembles the bark of the trees with white stripes imitating the "bloom" that is always found on growing shoots. The eggs of the first brood, tiny white specks, are laid on the upper surface of the leaves, close to an apple, rarely ever on the apple itself. The majority of the second brood eggs are laid on the surface of the apples, but not in the calyx end, as formerly supposed. The little worms hatch and break through the top of the egg shell and immediately seek a hiding place, which the greater number of them find in the calyx end of the apples, and many of the remaining ones where two apples touch. The little worm bores down into the flesh of the apple, those of the first brood going directly to the seeds in most cases. When full grown they bore out on the side of the apple, even where they went in at the calyx end, and crawl down the limb to the trunk of the tree, where they spin a loose cocoon under the bark. Here they remain between two and three weeks, when they appear as moths to lay eggs for the second brood. The second brood of worms come down in the same way, but are more careful to find a good hiding place, spinning a tough cocoon in which they remain all winter. On account of the fact that the broods overlap and that the second brood continues thru a long period, many people have decided that there are more than two broods. But everywhere that it has been carefully investigated throughout the larger part of the apple growing region, two broods and two only have been found. The great value of this knowledge lies in the fact that we can figure with absolute certainty that the few worms of the first brood that survive the poison will not produce more than ten to fifteen worms each during the rest of the season, since as far as we know, a pair of codling moths produce only from forty to fifty eggs, and it will be rare that all of these live to enter the apples. Our problem, therefore, is to kill the largest possible percentage of the first brood, so that there will be very few left to propagate, and to so place the poison that the greater number of their progeny will also be killed.

How the Worms are Killed.

It has been found, as the result of six years of experimentation, that if a proper amount of poison is placed in the calyx end of the apple, that ninety-six or ninety-seven per cent of the worms entering there will be killed, and that at the same time four-fifths of all those entering the sides will also be poisoned, thus reducing the possible second brood to a very small number. As two-thirds or more of the second brood enter the calyx end of the apple, which is still full of poison, they will meet a like fate, and even of those entering the sides a majority will be killed. The success of the spray lies in its power to practically annihilate the first brood of worms; the few remaining will be further reduced by spiders and predaceous insects, thus almost eliminating the second brood.

Continued in our Next Issue.

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NOTICE.

United States Land Office,
Salt Lake City, Utah,
April 15, 1909

To whom it may concern:

Notice is hereby given that the State of Utah has filed in this office lists of lands, selected by the said State, under Section 6 of the Act of Congress, approved July 16, 1894, as amended, School Lands, viz: Lots 1, 2, 3, 4, Sec. 26; Lots 1, 2, 3, 4, Sec. 27; T. 15 N., R. 2 W., Serial No. 00199; SE1/4 NE1/4 SW1/4 NW1/4; Lots 1 and 4, Sec. 4, T. 10 N., R. 7 W., Serial No. 02200. Copies of said lists, so far as they relate to said tracts by descriptive subdivisions, have been conspicuously posted in this office for inspection by any person interested and by the public generally. During the period of publication of this notice, or any time thereafter, and before final approval and certification, under departmental regulations of April 25, 1907, protests or contests against the claim of the State to any of the tracts or subdivisions hereinbefore described, on the ground that the same is more valuable for mineral than for agricultural purposes, will be received and noted for report to the General Land Office at Washington, D. C. Failure so to protest or contest, within the time specified, will be considered sufficient evidence of the non-mineral character of the tracts and the selection thereof, being otherwise free from objection, will be approved to the State.

E. D. R. THOMPSON,
Register.

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E. D. R. THOMPSON,
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NOTICE.

United States Land Office,
Salt Lake City, Utah,
March 20th, 1909.

To whom it may concern:

Notice is hereby given that the State of Utah has filed in this office lists of lands, selected by the said State, under Section 6 of the Act of Congress, approved July 16, 1894, as amended, School Lands, viz: S1/2 Sec. 10, and S1/2 Sec. 11, T. 14 N., R. 18 W., Serial No. 03030; W1/2 SE1/4 S1/2 NE1/4 Sec. 12, T. 14 N., R. 18 W., E1/2 NW1/4 Sec. 12, T. 14 N., R. 17 W., Serial No. 03031; S1/2 NE1/4 SE1/4 Sec. 5, T. 11 N., R. 6 W., Serial No. 03037; W1/2 NE1/4 NW1/4 SE1/4 NE1/4 SW1/4 Sec. 8, T. 12 N., R. 17 W., E1/2 SW1/4; Lots 3 and 4 sec. 15 NE1/4 SW1/4; Lots 2, 3, sec. 18; Lots 1, 3, 4, sec. 7, T. 14 N., R. 17 W., Serial No. 03031; S1/2 NE1/4 E1/2 SE1/4; Lots 1, 2, 3, 4, 7, 8, T. 11 N., R. 2 W., Serial No. 03034. Copies of said lists, so far as they relate to said tracts by descriptive subdivisions, have been conspicuously posted in this office for inspection by any person interested, and by the public generally. During the period of publication of this notice, or any time thereafter, and before final approval and certification, under departmental regulations of April 25, 1907, protests or contests against the claim of the State to any of the tracts or subdivisions hereinbefore described, on the ground that the same is more valuable for mineral than for agricultural purposes, will be received and noted for report to the General Land Office at Washington, D. C. Failure so to protest or contest, within the time specified, will be considered sufficient evidence of the non-mineral character of the tracts and the selection thereof, being otherwise free from objection, will be approved to the State.

E. D. R. THOMPSON,
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